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POST PRANDIAL BLOOD PRESSURE CHANGES IN PATIENTS WITH CHRONIC RENAL FAILURE DURING HEMODIALYSIS.

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ABTRACT:
Hypotension is a recognized complication of hemodialysis (HD), and many factors had been implicated one of which is eating before or during hemodialysis. Postprandial hypotension (PPH) was first recognized in 1977 by Seyer Hanseen. PPH is defined as decrease in systolic blood pressure or diastolic blood pressure of 20mmhg or more and 10mmhg or more respectively. The mechanisms of PPH are not fully understood but factors such as Impairment of baroreflex function, Inadequate postprandial increase in cardiac output, Impaired peripheral vasoconstriction, Insulin induced vasodilatation and Release of vasodilatory gastrointestinal peptides with attendant splanchnic blood pooling have been implicated. This study investigates the effect of food on blood pressure of patients during hemodialysis, with the view of proffering advice about meals during HD. The study was carried out over a six weeks period in St. Nicholas hospitals, Lagos, a privately owned 50-bedded hospital with a well developed renal transplant unit and a state of the art dialysis centre. There is also an efficient catering unit. Sixty one subjects were studied, 31 sessions being test session and 30 being controls. Of the 31 test sessions, 18 (58%) were males; and 13 (42%) were females while 18 (60%) of the controls were males and 12(40%) females, with age ranging from 15-79 years. The nature of the study was explained to the patients and consent obtained. Those who wished to eat were given a standard meal of their choice. Before the start of HD or eating, initial BP was taken. Freizinus$^{(R)}$ 4008 HD machines and bicarbonate dialysate fluid were used for all patients. Blood pressure was monitored hourly for 4 hours. The patients who took antihypertensives before hemodialysis or had cause to take them during HD were excluded from the study. Those who did not eat were used as controls. There was Postprandial hypotension in 7 (23%); 6(86%) Diastolic Blood Pressure only, 1 (14%) both Systolic blood pressure and Diastolic Blood Pressure. All the patients were monitored for symptoms of weakness, dizziness, and chest pain.

KEYWORDS: Postprandial, blood pressure, changes, patients, chronic renal failure, hemodialysis.

INTRODUCTION

Hypotension is a recognized and preventable complication of HD and our current understanding of postprandial hypotension is limited by the lack of a standardized, clinically meaningful definition (Jansen,1995). Analogous to orthostatic hypotension, postprandial hypotension is commonly defined in the literature as a decrease in systolic blood pressure of 20mmhg or more within 2 hours of the start of a meal (Jansen, 1995). Postprandial hypotension also develops when the absolute level of systolic blood pressure after a meal decreases to less than 90mmhg and when the systolic

blood pressure before a meal was greater than 100mmHg (Jansen 1995). After a meal, supine heart rate and cardiac output increase, while supine diastolic blood pressure and total systemic resistance decreases in normal healthy individuals. Food ingestion increases splanchnic and hepatic blood flow. Redistribution of volume compromises cardiac filling, decreases cardiac output, and leads to a decrease in mean arterial pressure.

TABLE 1: MEAN BP AT VARIOUS TIMES DURING HD

TIME(HR)	TEST(MMHG)	CONTROL(MMHG)
0	171 23 ----- ± ----- 94 14	169 23 ----- ± ----- 92 18
1	168 23 ------ ± ------ 92 15	168 22 ---- ± ------ 91 12
2	169 31 ------ ± ------ 94 19	176 27 ----- ± ------ 95 16
3	169 28 ------- ± ------ 93 18	176 26 ----- ± ------ 93 17
4	169 24 ------ ± ------ 92 19	182 27 ----- ± ----- 97 15

During hemodialysis and hypovolemia, the body tries to conserve blood flow to vital organs by vasoconstriction. Food ingestion during dialysis results in an obligatory increase in splanchnic blood flow with sequestration of blood in the splanchnic pool and decreases venous return. Though eating during hemodialysis sessions is a widespread practice, it may lower blood pressure, probably due to a reduction in peripheral vascular resistance from food's effect on alimentary tract blood flow (Barakat *et al* 1993).

Other factors responsible are, Impairment of baroreflex function, Inadequate postprandial increase in cardiac output, Impaired peripheral vasoconstriction, Insulin induced vasodilatation and Release of vasodilatory gastrointestinal peptides (Jansen 1989). Postprandial hypotension (PPH) was first

recognized in 1977 by Seyer-Hanseen in a patient with Parkinson's disease (Seyer-Hanseen 1977). Sherman *et al* in 1988 studied postprandial blood pressure changes during hemodialysis. In this study of 9 patients who had end stage renal disease (ESRD), but not diabetes, a standard meal was given during 62 of 125 dialysis treatments. Meals consisted of two slices of white bread, 2 ounces of turkey breast, pound cake, and 4 ounces of cranberry juice. During dialysis, blood pressures were measured by sphygmomanometry at 30-minute intervals prior to meals and every 15 minutes following meals. Hypotension was defined as a 25% or greater fall in mean arterial pressure from the blood pressure recorded immediately prior to feeding time. The investigators found that there were 13 episodes of symptomatic hypotension in the 45-minute postprandial intradialytic period compared with two episodes during the corresponding fasting period.

TABLE 2: BP WITH RESPECT TO SEX AT VARIOUS TIMES

		0 hr	1 hr	2 hrs	3hrs	4hrs
TEST	Males	$\frac{167}{96} \pm \frac{25}{14}$	$\frac{165}{92} \pm \frac{24}{17}$	$\frac{163}{94} \pm \frac{31}{20}$	$\frac{166}{94} \pm \frac{25}{19}$	$\frac{167}{91} \pm \frac{22}{16}$
	Females	$\frac{173}{90} \pm \frac{22}{15}$	$\frac{172}{91} \pm \frac{23}{14}$	$\frac{175}{94} \pm \frac{31}{19}$	$\frac{172}{93} \pm \frac{31}{16}$	$\frac{172}{93} \pm \frac{25}{16}$
CONTROL	Males	$\frac{166}{94} \pm \frac{23}{12}$	$\frac{164}{92} \pm \frac{25}{15}$	$\frac{167}{93} \pm \frac{25}{17}$	$\frac{169}{93} \pm \frac{22}{15}$	$\frac{176}{98} \pm \frac{26}{13}$
	females	$\frac{173}{90} \pm \frac{23}{16}$	$\frac{172}{91} \pm \frac{29}{19}$	$\frac{186}{95} \pm \frac{29}{16}$	$\frac{184}{94} \pm \frac{30}{19}$	$\frac{188}{97} \pm \frac{28}{17}$

Barakat *et al* in 1993 reported that food ingestion during dialysis causes hypotension primarily because of decrease in systemic vascular resistance. Other workers have demonstrated postprandial hypotension during Haemodialysis (Shibagaki 1998, Zocalli 1989 and Hirakata 1987). It May result in syncope, fall, dizziness, weakness, angina pectoris and stroke. Postprandial hypotension is distinct from and probably more common than orthostatic hypotension (Jansen and Lipsitz 1995).

AIMS AND OBJECTIVES

To determine the effect of food on blood pressure of patients during haemodialysis, with the view of proffering advice about feeding during haemodialysis.

MATERIALS AND METHOD

The study was carried out over a 6-weeks period in ST. Nicholas hospital, Lagos (SNH).SNH is a privately owned 50 bedded hospital with a well developed renal transplant unit and a state of the art dialysis centre with 7 functional dialysis machines. It also has standard and efficient catering unit. Freizinus 4008 HD machines and bicarbonate dialysate fluid was used for all patients.

There were a total of 61 subjects all of whom were hypertensive but not diabetic with age ranging between 15-79 years. Thirty one of them wished to eat and were given a standard meal of their choice and used as test subjects. Thirty of them who did not eat were used as controls.

Patients who took antihypertensive before HD or had cause to take them while on HD were excluded. The nature of the study was explained to patients, and consent obtained. Before the start of HD or eating, initial BP (O HR) was taken. Blood Pressure was monitored hourly for 4 hours by Sphygmomanometry and recorded. All the patients were monitored for symptoms of weakness, dizziness, and chest pain.

The Data was analyzed using the SPSS+PC statistical package and test of significance was done using t-test.

RESULTS:

Sixty one sessions were studied: 31 test sessions and 30 controls and their blood pressures are as presented in table 1. Of the 31 test sessions, 18 (58%) were males and 13 (42%) were females. Of the 30 control, 18 (60%) were males and 12 (40%) were females.

The Patients ages ranged between 15 and 79 years. All patients in the sessions had hypertension. The Mean Blood Pressure for all patients was $\frac{172}{99} \pm \frac{26}{17}$ MMHG, with the males having a mean blood pressure of $\frac{167}{94} \pm \frac{26}{16}$ MMHG and the Females $\frac{177}{93} \pm \frac{27}{18}$ MMHG. The Mean BP in the test and control for both sexes was $\frac{169}{93} \pm \frac{27}{17}$ MMHG and $\frac{174}{93} \pm \frac{25}{17}$ MMHG respectively.

There was Postprandial hypotension in a total of 7 (23%) patients; 6 (86%)of whom had Diastolic Blood Pressure reduction only and 1 (14%) had Systolic blood pressure and Diastolic Blood Pressure reduction.

There was no isolated Systolic Blood Pressure Postprandial hypotension.

There was increase in Blood Pressure in 9 patients (30%) of the Control. 5 of these patients (55%) had increase in Systolic blood pressure only, 2 (22%) diastolic blood pressure only; and 2(22%) a combination of Systolic Blood Pressure and Diastolic blood Pressure. There was 1 case (3%) of hypotension amongst the control. Only 2 (6%) of test group complained about weakness, but was not enough to discontinue HD.

DISCUSSSION

In this study we compared the effect of food on blood pressure of patients undergoing Hemodialysis using 31test subjects who ate just before or during hemodialysis and 30 control subjects who were in the fasting state during hemodialysis.

When compared to the controls, there were more significant falls in blood pressure among the test group ($P<0.05$). Postprandial hypotension occurred in 7 (23%); while only 1% of the control had postprandial hypotension.

However, there was increase in Blood Pressure in 9 (30%) Of Control; 5 (55%) Systolic blood pressure only, 2 (22%) diastolic blood pressure only; 2 (22%) Systolic Blood Pressure and Diastolic blood Pressure 2 (22%).

Hypotension though a complication of hemodialysis may be worsened by eating during or before Haemodialysis. Several factors had been implicated, which could be decreased cardiac output due

to splanchnic sequestration or decreased vascular resistance due to splanchnic vasorelaxation (Barakat *et al*, 1993). Although the mechanism is not fully understood, postprandial blood pressure reduction seems to be related to glucose related factors, since blood pressure only falls after oral glucose loading, but not after oral fructose, fat or protein loading. Vasoactive gastrointestinal hormones may play a role in the glucose induced vasodilation of splanchnic vasculature, but attempts to identify such hormones were unsuccessful (Jansen and Hoefnagels, 1989).It has been suggested that interference of insulin with a sympathetic response diminished by age or disease to splanchnic vasodilation, may be responsible for the postprandial fall in blood pressure in the elderly. However, vasodilator effects of insulin or a baroreflex response diminished by insulin do not seem to be involved (Jansen and Hoefnagels, 1989, 1990). The immediate cause of hypotension during dialysis is intravascular hypovolaemia which is related to the procedure itself (Shibagaki *et al*, 1998). To analyze the effects of food intake during hemodialysis on blood volume of the large vessels quantitatively, Shibagaki *et al*, (1998) monitored Hematocrit of the arteriovenous shunt blood continuously in the patients treated with hemodialysis regularly and estimated blood volume. They reported that food intake during hemodialysis decreases blood volume of the large vessels transiently but significantly. Blood pressure is dependent on blood volume especially in black subjects in whom hypertension is volume dependent. From our results, Diastolic Blood pressure seems to be mostly affected in postprandial hypotension during haemodialysis which is in consonance with work done by Sherman *et al* (1998). Males seem to be more affected by postprandial hypotension though the difference is not significant ($P>0.05$, Table 2). This may imply a sex difference in the pathophysiology of postprandial hypotension and requires further investigation. The hypotension is more marked the longer the patients stay on the dialysis machine as our results showed more significant difference in systolic blood pressure during the fourth hour (Table 1). Patients may be symptomatic of postprandial hypotension. Hypotension during dialysis may induce minor but troublesome side effects in the patient, such as nausea, vomiting, and dizziness, but may also lead to more serious complications, such as cardiac or cerebral ischemia. There are dialysis patients who hardly suffer from hypotensive episodes. However, HD-associated hypotension is especially frequent in elderly people and in those patients with a compromised cardiovascular system. Particularly the latter group, hypotension may have serious consequences (Reed and Devous, 1985). In our study, only 2 (6%) of test group complained about weakness, but was not enough to discontinue HD.

Eating has adverse effects on the hemodynamics of circulation during hemodialysis and should be avoided in patients with intradialytic hypotension. (Zocalli *et al*, 1989). All physicians caring for chronic renal failure patients should be aware of the hypotensive effects of food ingestion during haemodialysis. Postprandial hypotension should be considered in the evaluation of syncope, falls, dizziness and other cerebral ischaemic symptoms. Consumption of meal during haemodialysis should be avoided in patients at risk of hypotension during treatment. Further studies needs to be carried out to determine the effects of sex, Body Mass Index, age, aetiology of Chronic Renal Failure, blood flow rate, type and quantity of food on Blood Pressure during hemodialysis. The limitations in the study were non uniformity in timing of meals, the type and quantity of food and blood flow rate.

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